

REMARKS

I. Introduction

In response to the Decision on Appeal by the Board of Patent Appeals and Interferences dated August 19, 2009, Applicants have incorporated the limitations of claims 3, 5 and 7 into independent claim 1. Claims 3, 5 and 7 have been cancelled, without prejudice. No new matter has been added.

A Request for Continued Examination (RCE) is being filed concurrently with this Amendment.

Applicants respectfully submit that all pending claims are patentable over the cited prior art for the reasons set forth below.

II. The Rejection Of Claims 1-8 Under 35 U.S.C. § 103

Claims 1, 2 and 5-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamashita et al. (USP No. 6,287,720) in view of Fujiwara et al. (USP No. 6,576,366); and claims 3-4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamashita and Fujiwara and in further view of Shi et al. (US 2005/0014063). As claims 3, 5 and 7 have been incorporated into independent claim 1, Applicants will refer to amended independent claim 1 when addressing the rejection of claim 3 to Yamashita, Fujiwara and Shi. Applicants respectfully traverse these rejections for at least the following reasons.

With regard to the present disclosure, amended independent claim 1 recites a lithium secondary battery comprising a positive electrode comprising a composite lithium oxide, a negative electrode comprising a material capable of absorbing and desorbing lithium, a separator interposed between the positive electrode and the negative electrode, and a non-aqueous

electrolyte. The separator comprises a non-woven fabric having a melt-down temperature of 150°C or more. Adhering to the surface of the positive electrode and/or the negative electrode is a porous film having a thickness of not less than 0.5 μm and not more than 20 μm , and comprising an inorganic oxide filler and a binder. The filler comprises alumina, and the content of the filler in the porous film is not less than 50% by weight and not more than 99% by weight of the total weight of the porous film.

It is admitted in the October 25, 2008 Office Action that Yamashita fails to disclose a separator comprised of non-woven fabric. Fujiwara is alleged to disclose a series of separator materials including non-woven cloth (col. 9, lines 27-38). It is also alleged that Fujiwara teaches that non-woven cloths and polyethylene (PE) are art recognized equivalents for separator material and accordingly, it would be obvious to one of ordinary skill in the art to replace the PE layer in Yamashita with a non-woven cloth. In the Decision on Appeal, the Board agreed with the Examiner's assertion that a polyethylene (PE) microporous film and a non-woven fabric are interchangeable. However, the pending claims have been amended to further distinguish over the cited prior art.

There are several detrimental issues regarding non-woven fabric, such as polypropylene (PP) non-woven fabric. As is well-known in the art, PP has insufficient shutdown function, and increased occurrence of internal short circuit. The present specification discloses that the safety of the batteries were evaluated at 150 °C. At this temperature, the battery of Comparative Example 2, which only used PE as the separator and no porous film, was inferior in safety to Comparative Example 1, which uses PP for the separator. However, safety cannot be judged only by the evaluation at 150 °C. As shown in Table 2, Comparative Example 1, exhibits an

18% defective ratio, far more than any other example in the table, including Comparative Example 2. In addition, if the shutdown function is evaluated at a lower temperature, Comparative Example 2 would have a higher level of safety. As such, Applicants have demonstrated that the two materials are not interchangeable and that it is common knowledge in the art to use PE microporous film. Thus, for the present disclosure to show superior results even when using the polypropylene non-woven film is unexpected.

Furthermore, in response to the Applicants' arguments that the batteries of the present disclosure exhibit unexpected superior results, the Board held that the evidence provided (from the specification) was insufficient to overcome the finding of obviousness and was not commensurate in scope with the claims. In response, as Applicants have amended claim 1 to include the limitations of claims 3, 5 and 7 which recite that the thickness of the porous film is limited to be not less than 0.5 μm .

Applicants would point out that the battery of Example 2 has a porous film thickness of 0.3 μm and was the sole example used by the Board to allege that no difference in results exists between the Comparative examples (which have a porous film thickness of 5 μm) and the present disclosure. Now that independent claim 1 exhibits a range of thickness for the porous film to be 0.5 to 20 μm , Table 2 shows that the range in temperatures for nail penetration at a speed of 5 mm/s is 86-96 °C. In comparison, the nail penetration safety test results of Comparative Example 4 is 149 °C, which is about a 50 degree difference in temperature. This difference is very significant and completely unexpected. Accordingly, the use of both the porous film and the non-woven cloth in the separator exhibits superior and unexpected characteristics which are not disclosed or suggested in the cited prior art.

Furthermore, Applicants note that the Board's decision with regard to the evidence of the effects of unexpected results concerning the nail penetration test at 180 °C is now moot. As is shown with the nail speed of 5 mm/s, the difference between the Examples and Comparative Examiner is significant and unexpected. As such, Applicants submit that the cited prior art does not render amended independent claim 1 obvious.

In order to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. As is clearly shown, Yamashita, Fujiwara and Shi do not disclose a lithium secondary battery comprising: a separator interposed between said positive electrode and said negative electrode; and a non-aqueous electrolyte, wherein said separator comprises non-woven fabric, at least one of said positive electrode and said negative electrode has a porous film that is adhered to a surface thereof, said porous film has a thickness of not less than 0.5 µm and not more than 20 µm, and said porous film comprises alumina and a binder. Therefore, Applicants submit that Yamashita, Fujiwara and Shi do not render amended independent claim 1 of the present invention obvious and accordingly, Applicants respectfully request that the § 103(a) rejection of claim 1 be withdrawn.

**III. All Dependent Claims Are Allowable Because The
Independent Claim From Which They Depend Is Allowable**

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as independent claim 1 is patentable for the reasons set forth above, it is respectfully submitted that all pending dependent claims are also in condition for allowance.


IV. Conclusion

Having fully responded to all matters raised in the Office Action, Applicants submit that all claims are in condition for allowance, an indication of which is respectfully solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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